

REMARKS

Claims 40, 44, and 48 are amended to further clarify the nature of Applicants' claimed invention. Support for the amendment to claim 44 can be found, for example, at page 10, lines 1 – 3 of the specification. Support for the amendments to claim 40 and 48 can be found, for example, at page 12, lines 19 – 22 and page 29, lines 15 – 17 (Example 6) of the specification.

The rejection of claim 44 under 35 USC 112 is rendered moot by Applicants' amendment, as the subject matter noted by the Examiner has been removed from the claim. Reconsideration and withdrawal of the rejection are respectfully requested.

The rejection of claims 40 – 43, 45 – 49, 51, and 79 under 35 USC 103(a) over Rossin et al., US Patent 6,069,291, optionally in view of Okazake et al., US Patent 5,151,263 and Imamura, US Patent 5,649,985, is respectfully traversed. Rossin et al. discloses catalytic treatment of low concentrations of perfluoroalkanes such as CF₄, C₂F₆, etc., using aluminum oxide catalysts. Several elements, including nickel, may be added to the catalyst to stabilize it. However, Rossin et al. does not disclose or suggest catalysts that are effective for treatment of fluorine compounds in concentrations of 5000 ppm (0.5%) or higher, as required by the claimed invention. In particular, Rossin et al. provides no working examples at all of an aluminum oxide that also contains nickel.

Although no examples of a nickel-aluminum oxide catalyst are provided in Rossin et al., the Examiner notes the performance data from Example XVII in support of the rejection. Example XVII describes performance data for a zirconium-aluminum oxide catalyst, as described in Example XIV. This example

appears to have been selected based on the fact that it is the longest working example provided by Rossin et al. No other indication is given in the Office Action as to why the performance of a zirconium-aluminum oxide catalyst, or any of the other catalysts described in Rossin et al., is relevant in determining the patentability of a method involving the use of a nickel-aluminum oxide catalyst. Thus, the data in Example XVII does not appear to be relevant to the patentability of the methods of the claimed invention, which makes use of nickel-aluminum oxide catalysts.

However, even if performance data for the various catalysts disclosed in Rossin et al. is deemed to be relevant, such performance data does not support a rejection of the claimed invention. Example XVII discloses that a zirconium-aluminum oxide catalyst can convert 98% of a 400 ppm C₂F₆ gas stream for up to 400 hours. By contrast, the method of the claimed invention allows for conversion of more than 99% of a gas stream containing 5000 ppm or greater of a fluorine containing gas for more than 2000 hours. (See Kanno declaration submitted February 7, 2002.)

To further demonstrate the unexpected nature of this result, Applicants have provided a second declaration from Mr. Kanno. In this declaration, Mr. Kanno details experiments to create the zirconium-cobalt-aluminum oxide catalyst of Example XVI. In spite of some difficulties in preparing the zirconium-cobalt-aluminum oxide catalyst, the catalyst was successfully synthesized. This catalyst was then used under the conditions recited in Example XVII. As shown in Figure 1, the zirconium-cobalt-aluminum oxide catalyst of Example XVI performed at least as well or better than the zirconium-aluminum oxide catalyst

of Example XIV noted in the Office Action. The zirconium-cobalt-aluminum oxide catalyst was effective for conversion of over 99% of a gas stream containing 500 ppm of fluorine containing gas for time periods well in excess of 400 hours. (See Fig. 1, second Kanno declaration.) This represents a higher conversion rate over a longer period of time than the reported performance in Rossin et al. for the zirconium-aluminum oxide catalyst of Example XIV. However, at higher fluorine containing gas concentrations, the zirconium-cobalt-aluminum catalyst quickly lost its effectiveness. When used to treat a gas stream containing 5000 ppm of a fluorine containing gas, the conversion rate for the zirconium-cobalt-aluminum catalyst drops to below 40% in less than 200 hours. (See Fig. 2, second Kanno declaration.)

As demonstrated by the experimental results in the two Kanno declarations, the method of the claimed invention provides unexpectedly superior results relative to the methods described in Rossin et al. Rossin et al. provides no teaching or disclosure that the described catalysts are effective for treating gas streams containing 5000 ppm or more of a fluorine-containing gas. The experiments in the declarations also show that the benefits of the claimed invention are not merely inherent to the use of any of the broad range of catalysts disclosed in Rossin et al.

Additionally, the disclosures of Imamura and Okazake et al., either alone or in combination with Rossin et al., do not remedy the above shortcomings. For at least these reasons, reconsideration and withdrawal of the rejection to claims 40 – 43, 45 – 49, 51, and 79 is respectfully requested.

The rejection of claims 44 and 50 under 35 USC 103(a) over Rossin et al. in view of Rosenbaum, US Patent 5,460,792, is also respectfully traversed. In addition to failing to describe or suggest all of the limitations of the claimed invention, it is not even clear how or why the disclosures of Rossin et al. and Rosenbaum would be combined by one of skill in the art.

Claims 44 and 50 require decomposition of a fluorine-containing compound using a catalyst that contains aluminum oxide, nickel oxide, and zinc oxide. As described above, Rossin et al. fails to disclose or suggest a method for treating a fluorine-containing gas having a concentration of greater than 5000 ppm. Additionally, as noted by the Examiner, Rossin et al. does not disclose the use of zinc oxide. Rossin et al. also does not contemplate the use of carbonaceous catalysts. Rosenbaum describes carbonaceous catalysts for use in decomposing halogenated organic compounds. The carbonaceous catalysts are doped with various metals to provide catalytic activity. The organic compounds are then exposed to the doped carbonaceous catalyst at temperatures below 400°C. While Rosenbaum discloses use of zinc and nickel as a catalytic metal (Col. 13, line 59 to Col. 14, line 19), aluminum is not listed as a possible catalytic dopant. By contrast, Rossin et al. states that “aluminum oxide is the primary agent” for effecting the transformation of a perfluoroalkane. (Abstract) Additionally, Rosenbaum discloses use of the carbonaceous catalysts at temperatures of less than 400°C, while Rossin et al discloses temperatures between 400°C and 1000°C.

The Examiner asserts that the disclosure of both zinc and nickel in Rosenbaum provides the motivation to combine Rossin et al. with Rosenbaum.

Applicants respectfully disagree, as Rosenbaum does not even acknowledge the catalytic activity of aluminum, which is the primary material used in Rossin et al. Thus, one of skill in the art would not expect that the teachings of Rosenbaum could be applied to the invention of Rossin et al, especially given the different processing temperatures between the references.

Even if one of skill in the art would be motivated to combine Rosenbaum with Rossin et al., the combination would still not produce Applicants' claimed invention. Neither Rossin et al. nor Rosenbaum, either alone or in combination, provides a disclosure or suggestion of a method for treating a gas stream containing 5000 ppm or more of a fluorine containing gas. Thus, the combination of Rossin et al. and Rosenbaum would still fail to describe or suggest all of the features of the claimed invention. As a result, reconsideration and withdrawal of this rejection are respectfully requested.

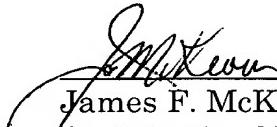
In view of the foregoing amendments and remarks, the application is respectfully submitted to be in condition for allowance, and prompt, favorable action thereon is earnestly solicited.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #056203.50311US).

Respectfully submitted,

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